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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/898,254	07/03/2001	Jennifer Quirin Trelewicz	BLD920010008US1	1933

7590	07/26/2005	**EXAMINER**	

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ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	09/898,254	TRELEWICZ ET AL.
	Examiner	Art Unit	
	James A. Thompson	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 May 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,7-9,13-19 and 23* is/are rejected.

7)☒ Claim(s) *4-6,10-12 and 20-22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5/11/05*.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments, see page 10, lines 6-11, filed 11
May 2005, with respect to the specification have been fully
considered and are persuasive. The objection to the
specification listed in item 1 of the previous office action,
dated 01 February 2005, has been withdrawn.

2.   Applicant's arguments, see page 10, lines 12-14, filed 11
May 2005, with respect to the Information Disclosure Statement
have been fully considered and are persuasive. The objection to
the Information Disclosure statement listed in item 2 of said
previous office action has been withdrawn.

3.   Applicant's arguments filed 11 May 2005 have been fully
considered but they are not persuasive.

   Regarding page 10, line 22 to page 11, line 18: Firstly, a
spot function is defined in the art as a function by which the
individual pixels in a halftone cell are turned on as the gray
scale value is increased. As discussed in detail on pages 4-5
of said previous office action, Hall (US Patent 5,579,457)
teaches defining a spot function that combines two functions
selected to provide a predetermined spot shape for use in a
halftone cell. The spot function is used to place the various
dots within the halftone cell to generate the desired shape for
each particular gray level. The pattern of halftone cell growth
defined by the function determines the precise shape the
resultant spot will take for a particular gray level value, such
as in figure 5b of Hall.

Regarding page 11, lines 19-22: Applicant's arguments are directed to the present amendments to the claims and not to the claims as filed immediately prior to said previous office action. The rejections based on prior art are given in detail below. The new grounds of rejection have been necessitated by the prior art.

Regarding page 12: Applicant's arguments have been addressed in full with the above responses.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 7-9, 15-19 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Hall (US Patent 5,579,457).

Regarding claims 1, 7 and 23: Hall discloses a printing system (figure 6 of Hall) comprising a control unit (figure 6(60 (portion)) of Hall) for receiving a print file (figure 3a and column 4, lines 40-44 of Hall) and processing the print file for printing (figure 2 and column 4, lines 36-38 of Hall). In order to input into an array (figure 3a and column 4, lines 40-44 of Hall) image data that is to be printed (column 11, lines 22-25 of Hall) and process said image data (figure 2 and column 4, lines 36-38 of Hall), said image data must inherently be received as a print file.

Hall further discloses a print head (figure 6(62) of Hall) for conveying a print job according to the print file (column 8, lines 5-12 of Hall); and a device (figure 6(60(portion)) of Hall) for generating a spot for use in halftoning (figure 5b and column 7, lines 17-21 of Hall) wherein the halftoning reproduces an image defined by the print file using the print head (column 8, lines 5-12 of Hall), the device defines a spot function that combines two functions (DX/DY , $\sin(K_1 + (K_2D) + K_3 \arctan(DY/DX))$) (column 6, lines 8-15 of Hall) selected to provide a predetermined dot shape for use in a halftone cell (column 6, lines 16-21 of Hall). As is well-know in the programming arts, "atan2(DX,DY)" is equivalent to writing "$\arctan(DY/DX)$". The values of DY and DX, and thus the values of the function $\arctan(DY/DX)$, is determined by a function demonstrated in a pseudo-code loop (column 5, lines 39-46 of Hall). The atan2(DX,DY) is then combined with the overall function $\sin(K_1 + (K_2D) + K_3 \arctan(DY/DX))$ to define the spot function (column 5, lines 46-48 and column 6, lines 11-15 of Hall).

Hall further discloses that said spot function scales the spot function using a parameterized spot radius scaling function that varies according to a value of a first and second spot function ordinate (column 6, lines 10-21 of Hall). The overall equation (column 6, lines 10-15 of Hall) defines the spot radius. Since the equation is a sine function, the spot radius varies from the minimum value to the maximum value, depending upon the resultant phase in the argument of the sine function, which is controlled by three parameters (K_1, K_2 and K_3) (column 6, lines 16-21 of Hall).

Hall further discloses that the device defines a shape changing scaling function ($K_2 D + K_3 \tan^{-1}\left(\frac{DY}{DX}\right)$) (column 6, lines 16-21 of Hall). By controlling the rate of turn of the spiral with K_2 and the number of arms of the spiral with K_3 (column 6, lines 16-21 of Hall), the shape of the spot function is changed and scaled.

The control unit and the device correspond to the portions of the computer system (figure 6(60) of Hall), along with the corresponding memory and embodied computer software, that perform the functions of said control unit and said device.

Further regarding claim 1: The printing system of claim 7 performs the method of claim 1.

Further regarding claim 23: The means for receiving recited in claim 23 corresponds to the control unit of claim 7. The means for conveying recited in claim 23 corresponds to the print head of claim 7. The means for generating recited in claim 23 corresponds to the device of claim 7.

Regarding claim 17: Hall discloses an article of manufacture (figure 6 of Hall) comprising a program storage medium (figure 6(61) of Hall) readable by a computer (figure 6 (60) of Hall), the medium tangibly embodying one or more programs of instructions executable by the computer to perform a method for halftoning an image (column 7, lines 32-34 and column 8, lines 1-4 of Hall). Said article of manufacture performs the method of claim 1, the arguments of which are incorporated herein.

Regarding claims 2, 8 and 18: The first function is an inverse trigonometric function ($\arctan(DY/DX)$) and the second function ($\sin(K_1 + (K_2 D) + K_3 \arctan(DY/DX))$) is a trigonometric function

based only in part on said first function. Further, the
variables D, DX and DY are set based on distances and
coordinates (column 5, lines 28-31 of Hall), and the variables
K_1, K_2 and K_3 are set based on desired spot function properties
(column 6, lines 16-21 of Hall). DX and DY are partly dependent
upon D since distances are based on relative coordinate value
differences (column 5, lines 28-31 of Hall). Further, since
$(\sin((\pi D/1.5) + \arctan(DY/DX)))$ can be rewritten as
$(\sin(K_1 + (K_2 D) + K_3 \arctan(DY/DX)))$, the values of K_1, K_2 and K_3, which
determine the properties of the spot function (column 6, lines
16-21 of Hall), are dependent upon the values of D, DX and DY.
Therefore, the two functions allow non-separable changes in spot
shape.

Regarding claims 3, 9 and 19: Hall discloses a two-
dimensional spot function described by $\sin(K_1 + (K_2 D) + K_3 \arctan(DY/DX))$
where DX and DY are defined by the 2-dimensional coordinate
system (column 5, lines 28-31 of Hall) and are therefore
functions of the first and second spot function ordinate, which
can be referred to as x and y. Therefore,
$f(x,y) = \sin(K_1 + (K_2 D) + K_3 \arctan(DY/DX))$ since $\arctan(DY/DX)$ and D are
both functions of x and y. An equivalent expression of the
function $f(x,y)$ can be given using a MacLaurin series expansion,
specifically:

$$f(x,y) = \sum_{j=0}^{\infty} \left\{ \frac{1}{j!} \left[\left(x' \frac{\partial}{\partial x'} + y' \frac{\partial}{\partial y'} \right)^j f(x',y') \right] \right\}$$

which can be expanded as:

$$f(x,y)=f(x,y)\big|_{\substack{x=0,\\y=0}}+\left[\left(\frac{\partial f(x,y)}{\partial x}\bigg|_{\substack{x=0,\\y=0}}\right)x+\left(\frac{\partial f(x,y)}{\partial y}\bigg|_{\substack{x=0,\\y=0}}\right)y\right]+$$

$$\frac{1}{2!}\left[\left(\frac{\partial^2 f(x,y)}{\partial x^2}\bigg|_{\substack{x=0,\\y=0}}\right)x^2+2\left(\frac{\partial^2 f(x,y)}{\partial x\partial y}\bigg|_{\substack{x=0,\\y=0}}\right)xy+\left(\frac{\partial^2 f(x,y)}{\partial y^2}\bigg|_{\substack{x=0,\\y=0}}\right)y^2\right]+\dots$$

Since the MacLaurin series is a cumulative function, the spot function can therefore be expressed as:

$$f(x,y)=f_1(x,y)+f_2^{com}(x,y)$$

where:

$$f_1(x,y)=\frac{1}{2!}\left[\left(\frac{\partial^2 f(x,y)}{\partial x^2}\bigg|_{\substack{x=0,\\y=0}}\right)x^2+2\left(\frac{\partial^2 f(x,y)}{\partial x\partial y}\bigg|_{\substack{x=0,\\y=0}}\right)xy+\left(\frac{\partial^2 f(x,y)}{\partial y^2}\bigg|_{\substack{x=0,\\y=0}}\right)y^2\right]+\dots$$

and

$$f_2^{com}(x,y)=f(x,y)\big|_{\substack{x=0,\\y=0}}+\left[\left(\frac{\partial f(x,y)}{\partial x}\bigg|_{\substack{x=0,\\y=0}}\right)x+\left(\frac{\partial f(x,y)}{\partial y}\bigg|_{\substack{x=0,\\y=0}}\right)y\right].$$

The portion $f_2^{com}(x,y)$ can be rewritten as $f_2^{com}(x,y)=\dfrac{f_2(x,y)}{S(p,x,y)}$

since p is an ordinate scaling constant that is set and equations for $f_2(x,y)$ and $S(p,x,y)$ can be set such that the equation for $f_2^{com}(x,y)$ hold true. For example, if

$$f_2(x,y)=\frac{f(x,y)\big|_{\substack{x=0,\\y=0}}+\left[\left(\frac{\partial f(x,y)}{\partial x}\bigg|_{\substack{x=0,\\y=0}}\right)x+\left(\frac{\partial f(x,y)}{\partial y}\bigg|_{\substack{x=0,\\y=0}}\right)y\right]}{xy}$$

and

$$S(p,x,y)=xy$$

then

$$f_2^{com}(x,y) = f(x,y)\Big|_{\substack{x=0,\\y=0}} + \left[\left(\frac{\partial f(x,y)}{\partial x}\Big|_{\substack{x=0,\\y=0}}\right)x + \left(\frac{\partial f(x,y)}{\partial y}\Big|_{\substack{x=0,\\y=0}}\right)y\right] = \frac{f_2(x,y)}{S(p,x,y)}$$

and therefore:

$$f(x,y) = f_1(x,y) + \frac{f_2(x,y)}{S(p,x,y)}.$$

The equation for $f(x,y)$ can therefore be equivalently expressed in this format.

Written in this form, $S(p,x,y)$ is a scaling function of $f_2(x,y)$. Further, if S is a function of radius $r = \sqrt{x^2 + y^2}$, then it is inherent that S may be equivalently written as $S(p,r)$. Since the relation between x and y is established with the equation $r = \sqrt{x^2 + y^2}$, then the function $S(p,x,y)$ can be expressed using one less dimension based on the relation between x and y. Since said relation is $r = \sqrt{x^2 + y^2}$, then the function S may be expressed as $S(p,r)$.

Regarding claim 15: Hall discloses a print program of a computer (column 11, lines 1-4 of Hall) for generating a print file (column 8, lines 5-12 of Hall), wherein the device comprises screening software loaded into the computer, the computer executing the screening software to perform the halftoning (column 7, lines 32-34 and column 8, lines 1-4 of Hall).

Regarding claim 16: Hall discloses that the device comprises software loaded into the control unit (column 11, lines 1-4 of Hall), wherein the control unit executes the software to perform the halftoning (column 7, lines 32-34 and column 8, lines 1-4 of Hall).

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103.(a) which

forms the basis for all obviousness rejections set forth in this

Office action:

> (a) A patent may not be obtained though the invention is not
> identically disclosed or described as set forth in section 102 of this
> title, if the differences between the subject matter sought to be
> patented and the prior art are such that the subject matter as a whole
> would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the
> invention was made.

7.   Claim 13 is rejected under 35 U.S.C. 103(a) as being

unpatentable over Hall (US Patent 5,579,457) in view of Vaswani

(US Patent 5,835,097).

Regarding claim 13:   Hall does not disclose expressly that

the device is a hardware card disposed between the control unit

and the print head.

Vaswani discloses a hardware card for graphics processing

(figure 3A(310) of Vaswani) disposed between a control unit

(figure 3A(301-304) of Vaswani) and an image output device

(figure 3A(305) of Vaswani) (column 6, lines 53-60 of Vaswani).

Hall and Vaswani are combinable because they are from

similar problem solving areas, namely the construction of an

electronic device that performs digital image data processing.

At the time of the invention, it would have been obvious to a

person of ordinary skill in the art to embody said device taught

by Hall as a hardware card disposed between a control unit and

an image output device, as taught by Vaswani, said control unit

being the control unit taught by Hall and said image output

device being the print head taught by Hall.   The motivation for

doing so would have been that, as is well-known in the art, a

separate hardware card for graphical processing decreases the

computational burden on the main computer processor. Therefore,
it would have been obvious to combine Vaswani with Hall to
obtain the invention as specified in claim 13.

8.   Claim 14 is rejected under 35 U.S.C. 103(a) as being
unpatentable over Hall (US Patent 5,579,457) in view of Cunniff
(US Patent 5,842,015).

Regarding claim 14: Hall does not disclose expressly that
the device is a hardware card disposed within the control unit.

Cunniff discloses a graphics hardware card (figure 1(16) of
Cunniff) disposed within a control unit (figure 1(18) of
Cunniff) (column 5, lines 52-57 of Cunniff).

Hall and Cunniff are combinable because they are from
similar problem solving areas, namely the construction of an
electronic device that performs digital image data processing.
At the time of the invention, it would have been obvious to a
person of ordinary skill in the art to embody said device taught
by Hall as a hardware card disposed within the control unit.
The motivation for doing so would have been that a separate
hardware card for graphical processing decreases the
computational burden on the main computer processor (column 1,
lines 21-26 of Cunniff). Therefore, it would have been obvious
to combine Cunniff with Hall to obtain the invention as
specified in claim 14.

Allowable Subject Matter
9.   Claims 4-6, 10-12 and 20-22 are objected to as being
dependent upon a rejected base claim, but would be allowable if
rewritten in independent form including all of the limitations
of the base claim and any intervening claims.

The following is a statement of reasons for the indication
of allowable subject matter:

Allowable subject matter was originally indicated in items
8-9 of the previous office action, dated 01 February 2005.
Furthermore, no additional prior art has been found which would
anticipate, or render obvious to one of ordinary skill in the
art, any of claims 4-6, 10-12 and 20-22.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of
rejection presented in this Office action. Accordingly, **THIS
ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is
reminded of the extension of time policy as set forth in 37
CFR 1.136(a).

A shortened statutory period for reply to this final action
is set to expire THREE MONTHS from the mailing date of this
action. In the event a first reply is filed within TWO MONTHS
of the mailing date of this final action and the advisory action
is not mailed until after the end of the THREE-MONTH shortened
statutory period, then the shortened statutory period will
expire on the date the advisory action is mailed, and any
extension fee pursuant to 37 CFR 1.136(a) will be calculated
from the mailing date of the advisory action. In no event,
however, will the statutory period for reply expire later than
SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Art Unit 2624

JAT
16 July 2005

THOMAS D.
TEAMLY LEE
PRIMARY EXAMINER